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ABSTRACT

A study on administrative problem solving is introduced in this paper, which summarizes the theoretical and methodological bases of the study and outlines the research design and data collection process. Three research areas are explored: (1) the relationship between problem solving and decision making; (2) types of administrative problems; and (3) differences between educational administrators and nonexpert administrators in problem solving. The primary purpose was the identification and comparison of differences in problem-solving practices between novice and expert elementary school principals. The sampling process identified four experience groupings: aspirants, rookie, seasoned, and veteran. Thirty-two principals and 10 educational administration students from 6 public school systems in London, Ontario,participated in the study, which involved interviews, small group discussion, questionnaires, and individual problem-solving exercises. Findings are presented in consecutive papers. Two tables provide participants' experience profiles and the data collection schedule. (34 references) (LMI)

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A STUDY OF PRINCIPAL PROBLEM SOLVING: AN INTRODUCTION TO THE STUDY

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Professionals, such as architects, lawyers, surgeons, and teachers, "share in common the ability to connect solutions to problems. And they are assumed to possess a special expertise that enables them to do this" (Kennedy, 1987, p. 133). Administrators, particularly administrators who work with and through other professionals, as do educational administrators, must logically be expected to have--or at least to aspire to--expertise of this kind. The hierarchical structure of organizations automatically ensures that problems will be brought to their attention. "Problems", Dwight Eisenhower, might just as easily have had blazoned on his desk, "end up here". Further, and as well illustrated by Mintzberg's (1973) research, successful administrators appear to be sensitive to--and often actively seek out--disturbances, opportunities for improvement, and other problems as they go about their daily business.

Even so, the mainstream literature of educational administration accords scant attention to this form of expertise, problem-solving typically being treated as a sub-element within the more grandly portrayed process of decision making. This emphasis is clearly illustrated by the index of the recently published Handbook of Research of Educational Administration (Boyan, 1988), where "Decision making" receives 30 entries for a total of 94 indexed pages, while "Problem solving" has only two entries indexing a mere four pages. Further, as exemplified by Simon's (1945) early work, by Litchfield's (1956) landmark article and, in educational administration specifically, by Griffiths (1959), Lipham and Hoeh (1974), Hoy and Miskel (1982) and the recent reviews in the Boyan Handbook (Estler, 1988; McNamara and Chisolm, 1988), the established literature has traditionally and typically concentrated on the application of normative models of rational choice to organizational decisions. This approach

elides interesting and important questions rooted in latent philosophical and functional differences between decision making and problem-solving and the role and place of each in administrative work. What are the differences between problem-solving and decision making? When, how and in what ways do decisions transmute into problems and vice-versa? What kinds of problems are encountered in administering schools and school systems? Do expert educational administrators recognize, analyze, and attempt to deal with problems differently from non-experts?

The research project summarized in this series of papers was primarily concerned with the last of these questions, although attention was also paid to the kinds of problems encountered in school administration. Questions of this kind have not been entirely ignored by students and scholars of educational administration. Hemphill (1958), in particular, was an early proponent of the centrality of problem-solving in administration, a line of enquiry which was pursued in the major (but subsequently--and strangely--largely neglected) study of Administrative performance and personality by Hemphill, Griffiths and Frederickson (1962). More recently Leithwood and his associates (e.g. 1986, 1989a, 1989b) have embarked on an extensive research program into the work and actions of educational administrators which explicitly addresses problem-solving processes and contexts. Our project complements the work of the Leithwood group in several ways and draws upon a similar literature base, but it was conceived and conducted independently as an extension of previous work by members of our research team (Nagy & Allison, 1988; Allison & Nagy, 1988; Nagy & Moorhead, 1990).

This paper summarizes the theoretical and methodological foundations of the study, and outlines the design and the data collection process. The papers

which follow consider preliminary findings. We wish to stress that the project is still under way and our analysis is far from complete. These papers should therefore be regarded as accounts of work-in-progress, rather than final reports.

The Literature

The literature forming the background to this study comes from several sources. Among these are work on memory for complex phenomena, the solution of ill-structured problems, expert-novice differences, and problem solving in school administration. As more detailed discussion is available in earlier writings (Nagy & Allison, 1988; Allison & Nagy, 1989; Nagy & Moorhead, 1990; Nagy, 1990), we present here only a brief overview.

Memory for complex phenomena. Researchers have posited several varieties of complex entities as organizing principles in attempting to understand memory for stories and sequences of events. Anderson, Spiro and Anderson (1978) describe schema theory, one version of such an organizing principle. Schemata act as mental structures; they incorporate general knowledge, and are more abstract than the particulars of a given situation. Interpretation of memory data involves matching elements in a specific situation to generic slots or placeholders. They report a study in which subjects read a restaurant story and a grocery-store story involving purchase of the same foods; the expectation was that the subjects' internal restaurant schemata would impose structure and result in an increase in memory. The results confirmed their expectation, and support the hypothesis that complex material is stored by complex mechanisms.

Cognitive theorists have debated the psychological status of schemata. Alba and Hasher (1983) argue that the evidence shows that stored memories are richer than the selected subset predicted by schema theory. This suggests, and

we concur, that it is appropriate to view schema theory as a method of imposing order on complexity, not necessarily involving any strong assumptions concerning the nature of human memory. This perspective gives the method the status of a portrayal technique, a heuristic device useful for imposing order on data.

As a device for imposing order and examining differences, schema theory holds promise. For example, Schallert (1982) notes that schemata evolve; that is, they become more elaborate and specific with experience. This suggests that an examination of the details of story-lines across individuals might be used to highlight differences in specificity or sophistication, differences which in turn might be linked to experience or expertise.

There is a difficulty with such a perspective, however -- how to decide what constitutes a more complete or more sophisticated version of a schema. For example, Horton and Mills (1984) reviewed the literature on human learning from a schemata perspective, using a levels-of-processing framework. They concluded that such an approach is plagued by the lack of an independent definition of depth of processing. Thus, a present limitation to the technique is reliance on subjective decisions concerning the adequacy or quality of particular pieces of data. In this project, we have somewhat ameliorated this difficulty by using a panel of expert judges to rate quality of our subjects' responses.

Ill-structured problems. Frederiksen (1984) summarized Simon's original distinction between well-structured and ill-structured problems. The characteristics of ill-structured problems include greater complexity, less definite criteria for deciding if a solution has been reached, lack of complete information, absence of a "legal move generator", and no convenient list of accepted procedures. They also have higher verbal content and are more

context dependent. Most "real-life" problems would be classified as ill-structured.

Methods for the analysis of ill-structured problems have evolved from those designed for well-structured ones (e.g., logic puzzles, chess). These methods have tended to take the form of production rules or flowcharts. Voss and Post (1988) noted that the method chosen for the analysis of ill-structured problems reflects the theoretical concerns of the investigators. A variety of approaches has been developed to meet various concerns. For example, Larkin (1980), working with physics and algebra problems, has found that large-scale units are useful in the analysis of problem solving in such domains. Voss, Greene, Post & Penner (1983), investigating how subjects would deal with the lack of productivity of the Soviet agricultural system, categorized statements as pertaining to goals or reasoning. Goal statements dealt with relatively global moves such as identification of major issues and subproblems, while reasoning statements dealt with the analysis within the structure of these subproblems. Finally, Lawrence (1988), in the context of judicial decision making, developed a model using elaborate if...then statements, in an attempt to capture a priori perspectives ("frames of reference"), which correspond, according to Voss and Post (1988), to the magistrates' courtroom schemata.

Expert-novice differences. Glaser and Chi (1988) have provided a general survey of the major literature on expert-novice differences in problem solving. With respect to ill-structured problems, Voss et al. (1983) have provided useful commentary with respect to the Soviet agriculture problem. Typically, expert reasoning shows how a more general solution can solve a number of related subproblems. General characteristics of expert solutions included the following: experts did not articulate their highest level plans; none spoke of a general

solution strategy; they did not begin with a well-developed plan, but reviewed the problem and then developed one; general plans could be classified as either problem conversion (to one they could solve) or problem decomposition; experts tried for one general solution to solve the problem, using a lot of reasoning; novices tended to deal with low level subproblems and use little reasoning. In solution activity, only experts examined the implications of their solutions. Experts spent a lot of time on argumentation.

School administration as problem solving. Two lines of research have examined the school principalship from a problem solving perspective. From an administrative perspective, Leithwood and Stager (1986) reported differences in principals' sorting of problems, their solution strategies, and the influences on their strategies and priorities. Their results showed that better principals use group solutions more often, and in different ways; they emphasise programs over buildings and relationships, and give fuller rationales. Better principals tackle fundamental rather than superficial problems, are more reflective and seek clarification more, and list more specific sources of information. Better principals are aware of "problem solving" as a definite activity and they enjoy it and are confident at it.

Leithwood and Stager (1987) analyzed expert and non-expert protocols on school problems, finding similarities in the two groups on clear (well-structured) problems and differences on unclear (ill-unstructured) ones. On ill-structured problems, experts were about the same as they were on well-structured, but non-experts had more interpretation statements, fewer goals and solution processes. The experts thought of school and system consequences; non-experts thought of personal consequences. Experts expressed belief in the power of rational thought; non-experts didn't. Experts

were more specific in statements and assumptions, and cited more relevant anecdotes. Experts planned more; non-experts paid little attention to planning.

Working more from a methodological perspective, the group reporting the present work have evolved a procedure through several studies, starting with methods closely related to Voss' work. The fundamental issue is whether differences in quality of response can be related to the nature as well as to the content of statements made. Nagy and Allison (1988) made some progress working with the case used in the present study. Unlike the Soviet agriculture real-world problem, their subjects were limited by the amount of information in the case. As a result, the system of statement categories was modified, yielding a system of 21 statement categories, no longer distinguishing between goals and reasoning. They also recognized the need to deal with relative expertise. Voss' approach did not focus on differences in quality of the responses of different experts.

This problem was pursued in Nagy and Moorhead (1990), using a different case study. Two conclusions are of interest. First, fine distinctions in the categorization of statements were abandoned in favour of a catch-all "reasoning". Second, faced with an inability to link intuitively-felt differences in quality with either differences in use of statement types or diagram shape, the authors resorted to a checklist of individuals consulted, information sought, and actions taken. On this basis, clear differences in relative expertise of subjects could be discerned, but the price was the absence of anything resembling cognitive science research on ill-structured problems.

Allison and Nagy (1989), again using the same case as used here, examined the links between cognitive science views of subjects' responses and the more

traditional educational administrative and personnel assessment perspectives. They began with a diagrammatic portrayal method, but found it unconnected with the other views of the transcripts, and with any intuitive notions of what "felt right". They formed several conclusions: first, diagrammatic portrayals of problem solving in school administration may not capture the data successfully; second, more probing of subjects may be required to deal with "things left unsaid" and individual differences in speaking style; and third, something like a context bound "marking scheme", and not merely a system of categorizing statement types, is required to differentiate between response quality. The present study has incorporated many of these suggestions.

Finally, Nagy (1990), working with group discussions of children dealing with a hypothetical family problem situation involving chores and allowances, has made an initial attempt to apply a schema approach to problem solving. His method involved a very detailed categorization of statements, followed by a categorization of the categories. The result was a set of thirteen statement types (actions and positions), which could be judged as representing minimal, typical, and enriched schemata of what constitutes fairness within a family. He concluded that individual elements or statements within discussions could be so classified, but that classification of entire discussions was impractical. However, it seems clear that schema theory, unlike diagrammatic portrayals, provides a mechanism for capturing enough context to make judgments of response quality.

Design

Given the theoretical context outlined above, the main objective of the study was to investigate and compare differences in problem solving between novice and expert principals. The study was delimited to the elementary school

principalship on the grounds that organizational and other differences between elementary and secondary schools would unnecessarily complicate matters. For reasons discussed later, the scope of the study was further limited to subjects residing within commuting distance of London, Ontario.

Our first design problem was how best to conceptualize the novice-expert continuum and select representative participants for the study. Defining and selecting members of the "novice-principal" (later renamed Rookie) group seemed relatively straightforward, the sole selection criterion being that participants had to have been recently appointed to their first principalship. We were aware, however, that new principals may have gained considerable familiarity with the problems of school administration through long service in subordinate positions of added responsibility [SPARs], particularly the vice-principalship. Some may even have gained de facto experience before becoming de jure principals by, for example, serving as a vice-principal of a twinned school. We attempted to control for the potentially confounding effects of experience gained in SPAR situations by including a group of Aspirant principals in the study. Members of this group were recruited from graduates of the Ministry of Education Part II principal certification course held in London in the summer of 1988 or 1989. Possession of this certificate and the prerequisite Part 1 certificate is a necessary qualification for appointment to the principalship in Ontario and we assumed that these graduates would be seeking such an appointment in the near future. Further, many Ontario school systems now routinely require completion of one or both of the principal's certification courses before appointing individuals to vice-principalships, a practice that we anticipated would limit the amount of SPAR experience within the Aspirant group.

Selecting an operational definition for identifying and recruiting "expert" principals was more difficult. We considered asking superintendents, peers and/or teachers to nominate "expert" principals, but rejected this approach on the grounds of inherent reliability, validity and ethical difficulties. We also considered using an independent measure of principal effectiveness to select our experts, but were uncomfortable with the limitations and possible biases which could result from this approach and thought that the pre-selection of participants through such a process might introduce a distorting "halo" effect into the study. Consequently we decided to select our "experts" solely on the basis of length of experience in the principalship. Experience, particularly experience gained in professional roles, is often associated with--indeed, is commonly taken as indicative of--expertise. Indeed, the two words share the same root; and while a novice by definition has little or no experience, an expert is commonly assumed to have a great deal. Further, one of the four scholarly definitions of expertise identified in Kennedy's (1987, p. 148) review of the literature is based on the view that "expertise evolves and develops with experience". Following Schon (1983; 1987) and Schwab (1978), she cautioned, however, that while experience appears to be a necessary precondition for expertise, time-in-role does not, by itself, necessarily produce experts, for "experience can only contribute to expertise if practitioners are capable of learning from it".

Thus, while our decision to select "expert" principals solely on the basis of experience considerably simplified the identification and recruitment of subjects, it ran the risk of failing to "capture" truly expert problem-solvers. Expressed another way, we had no way of knowing in advance whether the experienced principals selected for the study would turn out to be any better at problem-

solving than our Rookie, or even Aspirant, principals. Nevertheless, we viewed this aspect of the design as a major strength for it would allow us to test directly the degree to which experience-in-role is associated with problem-solving expertise and technique. To further strengthen this element of the design we decided to recruit one group of moderately experienced and another of highly experienced principals. In selecting the first of these groups, which we termed "Seasoned", we sought principals with 10-15 years of experience. The highly experienced group, which we dubbed our "Veterans", were selected on the basis of 20 or more years of experience gained in at least three different schools. Thus the four experience groupings originally defined in this study were Aspirants (qualified but not experienced), Rookie (in the first one or two years of experience), Seasoned (10-15 years of experience) and Veteran (more than 20 years).

Experience thus became the initial dependent variable in the design, with problem-solving technique and expertise being assessed through post-hoc analyses of how study participants "thought-through" a standardized case problem. In order to expand the scope of the study and increase the opportunities for triangulation within the data we also decided to conduct extensive interviews with study participants and gather data from a battery of pencil-and-paper instruments. Taken together, these activities would clearly require a substantial time commitment from participants. Consequently we decided to collect all of our data through a series of day-long research sessions held at the University of Western Ontario. In addition to standardizing the data collection process and minimizing the possibility of interruptions, this approach also had the desirable effect of removing the study participants from their working environment, a design feature which would, we hoped, better focus

their attention on the tasks we wanted them to perform. At the same time, centralizing data collection had the less desirable result of limiting potential participants to principals and aspirant principals residing within reasonable commuting distance.

Recruitment

Given this limitation, we recruited all participants from six public school systems within the immediate vicinity of London, Ontario. Proximity was not the sole selection criterion, for we wanted to draw principals from both rural and urban contexts. We also elected to exclude Roman Catholic systems in order to control for this variable. Formal permission to recruit participants was sought from and granted by the boards of each of the six systems selected. Letters were then sent to all elementary principals and graduates of the Principal's certification course in those systems explaining the study and inviting them to participate. Reply forms were included with the letters mailed to principals asking respondents to indicate the year in which they were first appointed as principals and the number of schools in which they had served as principals.

Approximately sixty principals and fifteen graduates of the principal's certification course volunteered to participate. Approximately forty-five of the principals satisfied our pre-determined criteria for inclusion in one of the relevant three experience categories. We planned to recruit a total of forty participants distributed equally across the four experience categories. We further planned to collect data from four participants at once, which would require a total of ten data collection sessions, each lasting a single day. Appropriate dates were selected and our volunteers were then contacted by telephone to schedule attendance at the data collection site. The scheduling task proved to be quite difficult, with a number of volunteers being unavailable on

some of our predetermined dates. Unforeseen circumstances also conspired to eliminate two of our scheduled data collection days, reducing the total number of possible participants to 32, although we were successful in recruiting an equal number of participants in each of our four experience categories.

After the data from the original four groups of principals had been analyzed, and it became evident that experience and expertise do not seem to be highly correlated, it was felt that there would be merit in adding, for the sake of comparison, a category of subjects who could truly be considered complete novices, in that they had not only had no experience in school administration, but had not yet begun their teaching careers. It can be argued that socialization into the administrative culture of schools begins with teachers, and thus that there are no true novices within the professional ranks. The datapool was, therefore, augmented by the addition of ten pre-service student teachers, and this group was dubbed Entrants. In the fall of the second year, pre-service students attending the Faculty of Education of The University of Western Ontario were invited to participate in the project. Volunteers were scheduled for data collection at mutually appropriate times, and all were handled individually. As will be explained later, these students were only asked to complete two portions of the data collection.

Table 1 summarizes years of relevant experience held by study participants in each of the predetermined experience categories. The Table shows that, as intended, none of the members of the Aspirant group had had experience as a principal, and on average they had gained less than one year of experience in subordinate positions of added responsibility. Indeed, the maximum SPAR experience in this group was one year. Most of the Rookies, on the other hand, had considerable SPAR experience, one member of this group having amassed 22

years of experience in such positions. All of the Rookies, nevertheless, had only been principals for three years or less, four of the eight having been principals for only one year or less. None of participants in our two experienced groups had had less than ten years of experience as a principal, our most experienced Veteran having served as principal for 28 years in 8 different schools. Table 1 also shows a clear break between experience in the principalship for the Seasoned and Veteran groups, members of the Seasoned group having been principals for an average of 13.6 years (minimum = 10 yrs; maximum = 16 yrs) and members of the Veteran group for an average of 23.9 years. While our participants were widely distributed in terms of administrative experience, Table 1 also shows that there was much less variation in the total number of years spent working in schools than might be expected, members of the Rookie group having, on average, begun their educational careers only a few years after members of the Seasoned group, and only five years or so after the Veterans. This was an unexpected but nonetheless intriguing development which is discussed more fully in one of the accompanying papers.

The data collection process

Each of the original round of data collection days (i.e. for the Aspirant, Rookie, Seasoned and Veteran groups) followed the same pattern, as summarized in Table 2. Participants were deliberately grouped together by experience, so that four members from the a single experience category attended each data collection session. Grouping participants together in this way, we reasoned, would minimize differences in status and help create a more comfortable and less threatening social setting. Participants were met on arrival at the research site and invited to a comfortable room for coffee and conversation with the researchers. When all of the four participants scheduled for a given day had

arrived, they and the four members of the research team assembled in a seminar room where the principal investigators presented an overview of the research project, explained the activities planned for the day, and invited questions from participants.

Once participant questions had been answered the principal investigators initiated a 10-20 minute round-table discussion on the topic of problems encountered in school administration. This activity was intended to serve four purposes. First, we thought that the sharing of experiences and opinions within a supportive small-group setting would further "break the ice" and help participants feel more at ease with the researchers, each other, and the research topic. Second, the discussions served to focus the attention of participants on the subject under investigation. Third, with the permission of the participants (none refused) these discussions were tape-recorded, thus allowing participants to become familiar with this aspect of the research procedure. Fourth, we thought that the content of the discussions might well yield useful insights into the problems encountered in school administration and the ways in which principals (and aspirants) think about them. Whether this will turn out to be the case is unclear at this stage as the tapes have not yet been analyzed.

After the group discussion, each participant was paired with a member of the research team, and the four participant-researcher pairs adjourned to separate rooms for the fact-finding and think-aloud exercises. The researchers first obtained permission to tape-record the session and then read the following instructions to participants:

> In this hour I will be asking you to take on the role of a principal recently appointed to a new school, about which you know very little. There are two parts to this exercise: first there is a fact-finding part, to give you the opportunity to obtain additional information about the school by asking me questions; secondly, you will be given a detailed report on a specific problem in the school and asked to think aloud as

> you read the case and think about how you would respond. We will do the fact finding phase first. Immediately after we finish this phase, I will give you the report on the specific problem in the school. The purpose of this fact finding session is to give you a chance to ask questions about the school, its organization, its staff, its context. You don't need to worry about the specific problem yet; this is an opportunity to learn about the school.
>
> You can start asking me questions now, and please tell me when you feel you are ready to stop asking questions and go on to the case.

Some participants responded by seeking clarification of the task. The researchers answered such questions by paraphrasing the instructions given above. When participants asked questions about the problem which was to be presented, the researchers replied that the nature of the problem would become clear from the written description to be presented latter.

The purpose of the fact-finding exercise was to generate data about the background and contextual information sought by participants in preparation for the problem-solving task which they knew lay ahead. In order for the exercise to work well and not distort the problem-solving activity which was to follow, we had to be able to provide plausible and consistent answers to likely questions, answers which would accurately mesh with and complement the problem which was to be presented. We prepared for this by developing a detailed profile of the fictitious school which provided the setting for the case problem. Some of this information, such as total enrolment and the location and age of the school, was included in the case study which presented the problem. The bulk of our profile information, however, including staff size and composition, grade enrolment, instructional program, community characteristics and school system organization and policy, was not included in the case and was only made available to participants if they asked appropriate questions during the fact-finding session. To ensure plausibility we asked three experienced superintendents to examine our initial profile and point out any oddities and

inconsistencies and a number of adjustments were made in the light of their comments. Members of the research team then memorized the profile information prior to the first fact-finding session. To help ensure consistency, each researcher also had access to a copy of the profile during the fact-finding sessions as an aide-memoir. Inevitably some of the participants asked questions for which we had no pre-determined answers. One, for example, asked how the staffroom was furnished; another asked about student washroom facilities. In such circumstances, that is when questions were asked for which we had no prepared answers, the researcher simply replied that he or she had no information on that point.

All of the participants used the fact-finding session to seek background information about the problem, but some sought considerably more information than others. The highest number of questions asked by a participant was 85; the lowest six. Preliminary results from our analysis of the transcripts of the fact-finding activity are presented in one of the accompanying papers.

When a participant declared that he or she did not wish to ask any further questions, the researcher introduced the think-aloud problem analysis exercise by reading a set of prepared instructions. These instructions asked participants to first read aloud the case which the researcher would provide, verbalizing any thoughts that occurred as they did so, and then think aloud as they worked on the problem presented in the case. Participants were specifically instructed to try and verbalize all of their thoughts from the moment they were handed the case until they had finished outlining their proposed course of action for dealing with the problem presented. Before embarking on the case problem itself, a short training session was held in which participants were asked to think aloud while working on two practice problems, both of which

were presented in written form so as to better conform to the requirements of the main task. After the first practice problem ("How many windows are there in your house?") the researcher provided corrective feedback and encouragement in order to help the participant become more proficient and comfortable with the think-aloud process. The second trial ("You are on your way to work and your car won't start") was provided for further practice. Once both trials had been completed, participants were handed a copy of the "Miss MacDonald" case, which is included in an appendix to the accompanying Nagy paper, and asked to begin reading and thinking aloud.

Verbatim transcripts have been prepared for the fact-finding and think-aloud sessions, but equipment malfunctions resulted in the loss of three sessions (1 in the Seasoned group and 2 in the Veteran group). Certain aspects of these lost sessions have been reconstructed from the interviewer's notes, but these were not considered sufficiently complete for full analysis purposes. The preliminary results of the fact-finding and think-aloud sessions presented in accompanying papers are thus based on a total of 29 transcripts. The paper by Nagy offers a detailed description of the method used to analyze the transcripts and emergent findings. As explained in more detail in the first of the Allison & Allison papers, three external judges have also rated the relative quality of the actions participants proposed to take in dealing with the Miss MacDonald problem. A high level of agreement was evident between the judges' ratings and they were subsequently collapsed into a single mean quality score which was used as a differentiating variable in our preliminary analyses.

The student teachers who were included in the second round of data collection were at this point dismissed with our thanks, since the subsequent data collection activities were considered to be irrelevant to them. In the

original round of data collection, however, when the think-aloud task was completed, participants and researchers gathered for a refreshment break, after which the participants completed a battery of pencil and paper tests. The battery of instruments included an extensive personal profile questionnaire designed to collect information about the interests, skills, and educational and career histories of participants. In addition, participants were asked to complete the Ghiselli (1971) Self-Description Inventory, a well-regarded inventory of managerial ability (Ghiselli, 1971), Fiedler's (1967) LPC Scale, a somewhat enigmatic but nonetheless widely used measure of leadership style, a role description instrument for the principalship originally used in the National Principalship Study (Gross & Trask, 1976), and the "worry scale" employed in the same survey, which seeks to identify aspects and elements of school administration which are of particular concern to respondents. Two instruments developed by the research team, a problem-solving orientation questionnaire and a values scale, were also included in the battery.

Most of these instruments were selected or developed to yield data for testing plausible hypotheses concerning problem-solving style and expertise. We were interested in investigating, for example, relationships between problem-solving expertise, experience, and scores on the Ghiselli scales, particularly the Initiative, Decisiveness, Self-Assurance and Supervisory Ability measures. Similarly, we anticipated that there would be a discernible relationship between value orientations as measured on our values scale and problem-solving styles identified through analysis of the fact-finding and think-aloud transcripts. Other instruments were included to increase the opportunities for triangulation within the data. Responses to the problem-solving orientation questionnaire, for example, should allow us to compare self-declared stances toward problem-

solving with the actual patterns of thinking revealed in the case analysis exercise. Finally, other instruments were primarily intended to help clarify and control for differences between participants in our four experience categories. The personal profile questionnaire, for example, provided data on the education, including graduate degrees, of participants.

All of the raw data from the instrument battery has been coded and entered into data bases and analysis is in progress. Early results from the analysis of selected instruments are presented in the first of the Allison & Allison papers.

Lunch followed the instrument battery, after which each participant was interviewed by the same researcher who had administered the morning fact-finding and think-aloud session. All of the interviews were recorded, and later transcribed, and each researcher also made extensive written notes. Both the notes and transcripts of the recordings were used for analysis. The interview protocol was divided into two parts. The first section contained six main questions and five follow-up questions or probes which were intended to obtain evaluative and reflective comments on the fact-finding and think-aloud activities. The first question, for example, asked respondents how realistic the Miss MacDonald case was in their view. Other questions sought to identify how participants had defined the problem and what they saw as the main variables and important issues. There was also a check question which asked participants how informed they considered themselves to be about school libraries and how knowledgeable they were about the Partners in Action document referred to in the case.

To end the first part of the interview the researcher showed the participant a list of nine major and six subsidiary factors relevant to the Miss MacDonald problem. Participants were then asked if there were any items on the list that

they had thought of but not mentioned during the think-aloud exercise or if there was anything on the list that they did not consider at that time but in retrospect thought might be relevant. These questions were used as a means of encouraging participants to reflect on and review how they had analyzed the case, with the researchers prompting participants to consider each of the factors in turn and probing for explanations of any major omissions or assumptions which had not been evident.

The second part of the interview dealt in more general terms with the problems encountered in school administration and how, in the perceptions and experience of our participants, they are best handled. A modified but largely parallel version was used for members of the Aspirant group who, by definition, had no direct experience of the principal's role. The interview protocol for principals included 27 main questions as well as a number of subsidiary probes. Examples include a question which asked respondents to describe a specific problem they had dealt with recently and how they had handled it, another which asked them to identify and describe any "rules of thumb" they used in handling problems and another which asked what advice they would give to a new principal about problem-solving.

The full interview, that is both parts, took between 1½-3 hours depending on the loquacity of the interviewee and/or the tenacity of the interviewer. Analysis of the notes and tapes has begun, but much yet remains to be done. Some preliminary results are presented in the second of the Allison & Allison papers.

Conclusion

The detailed overview of the design and execution of the study offered in this paper is intended to serve as both an introduction to the accompanying

papers and as a "road map" to help understand how the component parts of the project fit together and are related to each other. Each of the accompanying papers summarizes and comments on the preliminary results emerging from one of the main components of data collection process, the sequencing of the papers following the order in which each component was described in this paper. Thus, the first of the accompanying papers (Moorhead) focuses primarily on the fact-finding data, the Nagy paper which follows deals with the analysis of the think-aloud transcripts, the third paper discusses the quantitative analysis of the pencil and paper and related data and the fourth and final paper offers a qualitative analysis of the interview findings.

This study is by no means complete. Because there was so much data generated, large portions remain unanalyzed, and an examination of the inter-relationships between the various data sections has hardly begun. We intend to obtain quality assessments of the think-aloud transcripts from a variety of judges, partly to further refine our analysis of the original subjects and partly to provide a second level of data collection by recording and analyzing their discussions of the responses of our subjects. We would also like to extend our data base to include a category of experienced managers and administrators from outside of education -- subjects with expertise in a different context.

Finally, one other reason for providing a detailed account of the data collection procedure used in this study is that we thought the process itself might be of some general interest. On first encounter the process may appear somewhat formidable, but we were very pleased with the way it worked in practice and we believe our participants found the experience enjoyable, stimulating and worthwhile. It was also, we feel, an economical, efficient and controlled way of collecting a large body of varied data. Whether the game was

worth the candle will of course depend on what we finally learn from these data. But even if the final results prove disappointing, we believe that the data collection process which was developed for this study is in itself a valuable invention.

References

Alba, J. W., & Hasher, L. (1983). Is memory schematic? Psychological Bulletin, 93, 203-231.

Allison, P. & Nagy, P. (1989). Analysis of problem solving in school administration: A comparison of methods. A paper presented at the Annual Meeting of the Canadian Educational Research Association, Laval.

Anderson, R.C., Spiro, R.J. & Anderson, M.C. (1978). Schemata as scaffolding for the representation of information in connected discourse. American Educational Research Journal, 15, 433-439.

Boyan, N. J. (Ed.). (1988). Handbook of Research on Educational Administration. New York: Longman.

Estler, S. (1988). Decision making. in Boyan, N. J. (Ed.). Handbook of Research on Educational Administration. New York: Longman.

Fiedler, F.E. (1967). A theory of leadership effectiveness. New York, NY: McGraw-Hill Book Co.

Frederiksen, N. (1984). Implications of cognitive theory for instruction in problem solving. Review of Educational Research, 54, 363-407.

Ghiselli, E.E. (1971). Explorations in managerial talent. Pacific Palisades, Calif.: Goodyear Publishing.

Glaser, R., and Chi, M.T.H. (1988). Overview. In M.T.H. Chi, R. Glaser, and M.J. Farr (Eds.). The nature of expertise. Hillsdale, NJ: Lawrence Erlbaum Assoc.

Griffiths, D.E. (1959). Administrative theory. New York: Appleton-Century-Crofts.

Gross, N. & A.E. Trask. (1976). The sex factor and the management of schools. New York: Wiley.

Hemphill, J. K. (1958). Administration as problem solving. In A. W. Halpin (Ed.), Administrative theory in education. Chicago: University of Chicago Press.

Hemphill, J. K., Griffiths, D. E., & Frederiksen, N. (1962). Administrative performance and personality. New York: Teachers' College Press.

Horton, D. L., & Mills, C. B. (1984). Human learning and memory. Annual Review of Psychology, 35.

Hoy, W.K. & C.G. Miskel. (1982). Educational administration: theory, research and practice. (2nd edition). New York: Random House.

Kennedy, M.M. (1987). Inexact sciences: professional education and the development of expertise. in E.Z. Rothkopf (Ed.) Review of research in education. Washington, D.C.: American Educational Research Association.

Larkin, J. H. (1980). Teaching problem solving in physics: The psychological laboratory and the practical classroom. In D. T. Tuma & F. Reif (Eds.), Problem solving and education: Issues in teaching and research. Hillsdale, NJ: Lawrence Erlbaum Associates.

Lawrence, J.A. (1988) Expertise on the bench: Modelling magistrates' judicial decision-making. In M.T.H. Chi, R. Glaser, and M.J. Farr (Eds.). The nature of expertise. Hillsdale, NJ: Lawrence Erlbaum Assoc.

Leithwood, K.A. & Stager, M. (1986). Differences in problem solving processes used by moderately and highly effective principals. A paper presented at the Annual Meeting of the American Educational Research Association, San Francisco.

Leithwood, K.A. & Stager, M. (1987). Components of expertise: "Artistry" in principals' problem solving. A paper presented at the Annual Meeting of the Canadian Society for the Study of Education, Hamilton.

Leithwood, K.A. & R. Steinbach. (1989a). Components of Chief Executive Officers' problem solving. Paper presented at the Annual Meeting of the American Educational Research Association , San Francisco.

Leithwood, K.A., B. Cousins & M. Smith. (1989b). A description of the principal's world from a problem solving perspective. Paper presented at the Annual Meeting of the Canadian Society for the Study of Education. Quebec City.

Lipham, J.M. & J.A. Hoeh. (1974). The principalship: foundations and functions. New York: Harper & Row.

Litchfield, E. H. (1956). Notes on a general theory of administration. Administrative Science Quarterly, 1, 3-29.

McNamara, J.F. & G.B. Chisolm. (1988). in Boyan, N. J. (Ed.). (1988). Handbook of Research on Educational Administration. New York: Longman.

Mintzberg, H. (1973). The nature of managerial work. New York: Harper & Row.

Nagy, P. (1990). Assessing thinking skills in social problem solving. A paper presented at the Annual Meeting of the American Educational Research Association, Boston. (TM 014 732).

Nagy, P. & Allison P.A. (1988). School-level decision making: A cognitive perspective. A paper presented at the Annual Meeting of the Canadian Society for the Study of Education, Windsor.

Nagy, P. and Moorhead, R. (1990). Administrative response to classroom testing data: A problem solving perspective. Alberta Journal of Educational Research, 36, 18-34.

Schallert, D.L. (1982). The significance of knowledge: A synthesis of research related to schema theory. In (W. Otto & S. White, Eds.). Reading expository material. Toronto: Academic Press.

Simon, H.A. (1945). Administrative behavior. New York: MacMillan

Smith, M.U. and Waterman, M.A. (1987). Categorizations of classical genetics problems by successful and unsuccessful problem solvers. A paper presented at the Annual Meeting of the American Educational Research Association, Washington.

Voss, J.F., Greene, T.R., Post, T.A., & Penner, B.C. (1983). Problem solving skill in the social sciences. In G.H. Bower (Ed.). The psychology of learning and motivation: Advances in research theory. (pp 165-213). New York: Academic Press.

Voss, J.F. & Post, T.A. (1988). On the solving of ill-structured problems. In M.T.H. Chi, R. Glaser, & M.J. Farr (Eds.). The nature of expertise. (pp. 261-285). Hillsdale, NJ: Lawrence Erlbaum.

TABLE 1

EXPERIENCE PROFILES OF STUDY PARTICIPANTS BY GROUP

		CLTCHX	SPARX	PRINX	TOTSCHX	TOTPRIN
	N	Mean years of experience				Mean
Entrants	10	0	0	0	0	0
Aspirants	8	15.6	0.9	0.0	16.5	0.0
Rookies	8	11.8	9.4	1.6	22.6	1.5
Seasoned	8	8.1	3.6	13.6	25.4	3.6
Veterans	8	3.9	0.4	23.9	28.1	5.0
TOTAL	42	9.8*	3.6	9.8	23.2	2.5

CLTCHX = Years of experience as a classroom teacher only
SPARX = Years of experience in subordinate positions of added responsibility
PRINX = Years of experience as a principal
TOTSCHX = Total years of professional experience (CLTCHX+SPARX+PRINX)
TOTPRIN = Number of principalships held (i.e. in different schools)

* Means in this line are for the Aspirant, Rookie, Seasoned and Veteran respondents (N=32).

TABLE 2

DATA COLLECTION SCHEDULE*

8:30	Participants arrive, meet researchers, have informal coffee.
9:00	Full group session: introductions, discussion of typical problems faced by principals.
9:45	Participants and researchers pair off and complete the fact-finding and the think-aloud exercise.
10:45	Coffee.
11:00	Participants complete pencil and paper instruments.
12:15	Lunch, hosted by researchers.
1:30	Participant/research pairs complete the interview schedule (no time limits).

* For Aspirant, Rookie, Seasoned and Veteran groups only.